

Japanese Kokai Patent Application No. P2001-116968A

**BEST AVAILABLE COPY**

---

Job No.: 1394-102421

Ref.: JP2001-116968A

Translated from Japanese by the Ralph McElroy Translation Company  
910 West Avenue, Austin, Texas 78701 USA

JAPANESE PATENT OFFICE  
PATENT JOURNAL  
KOKAI PATENT APPLICATION NO. P2001-116968A

Int. Cl.<sup>7</sup>: G 02 B 6/44  
6/00  
6/46

Filing No.: P2000-29561

Filing Date: February 7, 2000

Publication Date: April 27, 2001

Priority  
Date: August 11, 1999  
Country: Japan (JP)  
No.: Hei 11[1999]-227324

No. of Claims: 6 (Total of 11 pages; OL)

Examination Request: Not filed

OPTICAL COMMUNICATION TRUNK CABLE AND BRANCHING TOOL FOR OPTICAL  
COMMUNICATION TRUNK CABLE

Inventors: Takeo Takahashi  
Saitama Factory  
Toyokuni Electric Cable Co., Ltd.  
4125 Saitama, Gyoda-shi,  
Saitama-ken

Kimio Ito  
Saitama Factory  
Toyokuni Electric Cable Co., Ltd.  
4125 Saitama, Gyoda-shi,  
Saitama-ken

Toshiyuki Igarashi  
Saitama Factory  
Toyokuni Electric Cable Co., Ltd.  
4125 Saitama, Gyoda-shi,  
Saitama-ken

Makoto Hodohara  
Saitama Factory  
Toyokuni Electric Cable Co., Ltd.  
4125 Saitama, Gyoda-shi,  
Saitama-ken

Hajime Tamura  
Saitama Factory  
Toyokuni Electric Cable Co., Ltd.  
4125 Saitama, Gyoda-shi,  
Saitama-ken

Fumihiro Akizuki  
Saitama Factory  
Toyokuni Electric Cable Co., Ltd.  
4125 Saitama, Gyoda-shi,  
Saitama-ken

Hideaki Tajima  
Saitama Factory  
Toyokuni Electric Cable Co., Ltd.  
4125 Saitama, Gyoda-shi,  
Saitama-ken

Kenji Nonaka  
Saitama Factory  
Toyokuni Electric Cable Co., Ltd.  
4125 Saitama, Gyoda-shi,  
Saitama-ken

Applicant:

000110309  
Toyokuni Electric Cable Co., Ltd.  
2-30-11 Minamikebukuro,  
Toshima-ku, Tokyo

Agent:

100080838  
Mitsuyasu Miura, patent attorney

[There are no amendments to this patent.]

#### Abstract

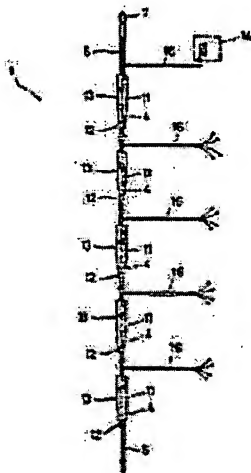
##### Objective

To provide an optical communication trunk cable and a branching tool for optical communication trunk cable capable of wiring the optical communication cable by conducting

hard work, such as welding and connecting, in a factory and by using the branching tool for installation with simple on-site work and capable of being transferred in the same manner as a conventional cable from the factory to the work site.

### Constitution

The optical communication trunk cable is comprised of a connecting optical cable, wherein the sheath in at least two prescribed locations on the optical communication trunk cable main body, which has a plurality of coated optical fibers or optical fiber tapes covered by the sheath, is removed at the factory, and wherein a connector is attached to the end by welding/connecting to the removed coated optical fibers or optical fiber tapes, and a branching tool comprised of a base plate on which a connecting tool, which is used for connecting the connector of the connecting optical cable and the connector of an FO cable connected to an optical wiring box at the work site, is mounted, a case body that covers the optical communication trunk cable main body at the position of the base plate, and a cover body, wherein the base plate that is installed in a detachable manner on the case body is accommodated.



### Claims

1. An optical communication trunk cable characterized in that it comprises an optical communication trunk cable main body, wherein a plurality of coated optical fibers or optical

fiber tapes used in a state suspended from top to bottom of a structure are covered by a sheath, a connecting optical cable, wherein the sheath, in at least two prescribed locations on the optical communication trunk cable main body, is removed at the factory, and wherein a connector is attached to the end by welding/connecting to preset coated optical fibers or optical fiber tapes in the optical communication trunk cable main body; a cover that covers the bottoms of the areas where the sheath has been removed such that the end of the aforementioned connecting optical cable projects outwards, and a branching tool comprised of a base plate on which a connecting tool, which is used for connecting the connector of the connecting optical cable and the connector of an FO cable connected to an optical wiring box at the work site, is mounted; a case body that covers the base plate and the optical communication trunk cable main body at the position of the base plate; and a cover body, wherein the base plate that is installed in a detachable manner on the case body is accommodated.

2. An optical communication trunk cable characterized in that it comprises an optical communication trunk cable main body, wherein a plurality of coated optical fibers or optical fiber tapes used in a state suspended from top to bottom of a structure are covered by a sheath; a connecting optical cable, wherein the sheath, in at least two prescribed locations on the optical communication trunk cable main body, is removed at the factory, and wherein an MU-type simple ferrule is attached to the end by welding/connecting to preset coated optical fibers or optical fiber tapes in the optical communication trunk cable main body; a cover that covers the areas where the sheath has been removed such that the end of the aforementioned connecting optical cable projects outwards; and a branching tool comprised of a base plate on which a connecting tool, which is used for connecting the MU-type simple ferrule of the connecting optical cable and the connector of an FO cable connected to an optical wiring box at the work site, is mounted; a case body that covers the base plate and the optical communication trunk cable main body at the position of the base plate; and a cover body, wherein the base plate that is installed in a detachable manner on the case body is accommodated.

3. An optical communication trunk cable characterized in that it comprises an optical communication trunk cable main body, wherein a plurality of coated optical fibers or optical fiber tapes used in a state suspended from top to bottom of a structure are covered by a sheath; a connecting optical cable, wherein the sheath, in at least two prescribed locations on the optical communication trunk cable main body, is removed at the factory, and the preset coated optical fibers or optical fiber tapes in the optical communication trunk cable main body are drawn out a certain distance with an MT connector attached to the ends of the drawn-out coated optical fibers or optical fiber tapes and another MT connector attached to the aforementioned MT connector and a simple ferrule attached to the end of the connecting optical cable, a cover that covers one end of the areas where the sheath is removed such that the end of the aforementioned drawn-out

coated optical fibers or optical fiber tapes projects outwardly, and a branching tool comprised of a cover body having a simple receptor used for connecting the simple ferrule of the aforementioned connecting optical cable to one end that covers the areas where the sheath is removed.

4. A branching tool for an optical communication trunk cable comprised of a base plate on which a connecting tool used for connecting the connector at the end of a connecting optical cable welded and connected to optical fibers or optical fiber tapes branched from an optical communication trunk cable and the connector of an FO cable connected to an optical wiring box is mounted, a case body that covers the base plate and the optical communication trunk cable at the position of the base plate, and a cover body wherein the base plate that is installed in a detachable manner on the case body is accommodated.

5. A branching tool for an optical communication trunk cable comprised of an accommodating part that accommodates a connecting tool used for connecting the connector at the end of a connecting optical cable welded and connected to optical fibers or optical fiber tapes branched from an optical communication trunk cable and the connector of an FO cable connected to an optical wiring box and that accommodates the welded and connected part, a case body that covers the base plate and the optical communication trunk cable at the position of the base plate, and a cover body wherein the base plate that is installed in a detachable manner on the case body is accommodated.

6. A branching tool for an optical communication trunk cable comprised of a case body that can house in a detachable manner the optical communication trunk cable in the areas where the sheath is removed and a simple receptor used for connecting a simple ferrule of a connecting optical cable connected to the coated optical fibers or optical fiber tapes drawn out from the aforementioned optical communication trunk cable via an MT connected to one end of the case body.

#### Detailed explanation of the invention

[0001]

#### Industrial application field

The present invention pertains to an optical communication trunk cable and a branching tool for optical communication trunk cable used when setting an optical communication trunk cable in office buildings or other structures.

[0002]

Prior art

Conventionally, in a private optical cabinet PT, in an office building or other structure, connected to a buried optical communication trunk cable from the outside, prescribed optical fiber tapes in the optical communication trunk cable suspended from the top of the structure are welded and connected to a private optical cabinet PD set on a prescribed floor, and optical cables on that floor and its adjacent floors are used to form the connection from said private optical cabinet PD to the circuit connecting device set on each floor.

[0003]

Problems to be solved by the invention

In a conventional optical communication trunk cable used in a suspended state in a structure, the sheath must be removed at prescribed positions at the work site and the optical fiber tapes of the optical communication trunk cable must be connected to the private optical cabinet PD. This operation is labor-intensive, which is disadvantageous.

[0004]

The purpose of the present invention is to solve the aforementioned problem by providing an optical communication trunk cable and a branching tool for an optical communication trunk cable capable of wiring the optical communication cable by performing hard work, such as welding and connecting, at the factory, and by using the branching tool for installation by means of work at the job site and capable of being transferred in the same manner as a conventional one from the factory to the job site.

[0005]

The aforementioned and other purposes as well as the novel characteristics of the present invention will be further clarified by the following explanation made with reference to the attached figures. The figures, however, are used only for purposes of explanation and do not limit the technical scope of the present invention.

[0006]

Means to solve the problems

In order to realize the aforementioned purpose, the present invention provides an optical communication trunk cable characterized by having an optical communication trunk cable main body wherein a plurality of coated optical fibers or optical fiber tapes used in a state suspended from the top to the bottom of a structure are covered by a sheath, a connecting optical cable

wherein the sheath in at least two prescribed positions on an optical communication trunk cable main body is removed at the factory and wherein a connector is attached to the end welded and connected to preset coated optical fibers or optical fiber tapes in the optical communication trunk cable main body, a cover that covers the bottoms of the areas where the sheath is removed such that the end of the aforementioned connecting optical cable projects outwardly, and a branching tool comprised of a base plate on which a connecting tool used for connecting the connector of the connecting optical cable and the connector of an FO cable connected to an optical wiring box at the job site is mounted, a case body that covers the base plate and the optical communication trunk cable main body at the position of the base plate, and a cover body wherein the base plate that is installed in a detachable manner on the case body is accommodated.

[0007]

The present invention also provides a branching tool for an optical communication trunk cable comprised of a base plate on which a connecting tool used for connecting the connector at the end of a connecting optical cable welded and connected to optical fibers or optical fiber tapes branched from an optical communication trunk cable and the connector of an FO cable connected to an optical wiring box is mounted, a case body that covers the base plate and the optical communication trunk cable at the position of the base plate, and a cover body wherein the base plate that is installed in a detachable manner on the case body is accommodated.

[0008]

Embodiment of the invention

In the following, the present invention will be explained in more detail with reference to application examples shown in the figures.

[0009]

In the first embodiment of the present invention shown in Figures 1-9, 1 represents the optical communication trunk cable of the present invention suspended from the top floor of office building or other structure 2 to the bottom floor via through-holes 3, 3, 3, 3 formed on each floor. Said optical communication trunk cable 1 is manufactured in a factory based on a design suitable for a specific job site. The optical communication trunk cable is comprised of tape slot type optical communication trunk cable main body 5 having five 4-count optical fiber tapes 4, 4, 4, 4, 4 as shown in Figure 3, cable suspending tool 7 that can be installed on installation fixture 6 fixed on the ceiling of said structure 2 and is attached to the upper end of said optical communication trunk cable main body 5 as shown in Figure 4, connecting optical cables 11, 11, 11, 11, 11 which have sheath 8 of said optical communication trunk cable main



body 5 at the position of each floor of said structure 2 removed as shown in Figure 5 and are welded and connected to preset 4-count optical fiber tapes 4, 4, 4, 4, 4, of optical communication trunk cable main body 5 and which are covered by protective tube 9 and have MU-type simple ferrules 10, 10, 10, 10, 10 attached to the end, and covers 12, 12, 12, 12, 12 which cover the bottom of the areas where said sheath 8 is removed such that the ends of said connecting optical cables 11 project outwardly.

[0010]

13, 13, 13, 13, 13 represent branching tools, which connect said connecting optical cables 11, 11, 11, 11, 11 to FO cables 16, 16, 16, 16, 16 having MU-type connector 15 connected to optical wiring boxes 14, 14, 14, 14, 14 and which cover the connected parts. As shown in Figures 7-9, each of said branching tools 13, 13, 13, 13, 13 is comprised of a base plate 19 that can be supported in the area of said optical communication trunk cable main body 5 where sheath 8 is removed and has accommodating part 17 accommodating the welded and connected part of said connecting optical fiber 11 and has a connecting tool 18 used for connecting the MU-type simple ferrules 10, 10, 10, 10 of said connecting optical cable 11 to the MU-type connector 15 of said FO cable 16, a box-shaped case body 21 having a gradually reduced bottom part and base plate supporting part 20 that can cover said base plate 19 and the area of said optical communication trunk cable main body 5 where base plate 19 is installed, and a cover body 23 having a gradually reduced bottom part and having said base plate 19 positioned inside and mounted on said case body 21 with multiple screws 22 to cover the opening part 21a of said case body 21.

[0011]

Connecting optical cables 11, 11, 11, 11, 11 are welded and connected to optical communication trunk cable main body 5 with the aforementioned configuration at the factory. With the connected parts protected by protective covers, etc., the optical communication trunk cable main body is delivered to the work site, where it is suspended from the top floor to the bottom floor of structure 2 while branching tools 13, 13, 13, 13, 13 are installed. It is also possible to install branching tools 13, 13, 13, 13, 13 after the optical communication trunk cable main body is suspended from top floor to the bottom floor of structure 2. In this way, optical communication trunk cable 1 is completed.

[0012]

Other embodiments of the invention

Other embodiments of the present invention will be explained below with reference to Figures 10-22. When explaining these embodiments of the present invention, the same

constituent parts as those described in the first embodiment are represented by the same respective symbols. Their explanation is omitted.

[0013]

Figures 10-13 show the second embodiment of the present invention. The main difference from the first embodiment of the present invention is using branching tools 13A, 13A, 13A, 13A, 13A having case body 21A and cover body 23A with gradually reduced upper and lower ends. Optical communication trunk cable 1A using 13A, 13A, 13A, 13A, 13A formed this way has the same effect as that described in the first embodiment of the present invention.

[0014]

Figures 14-17 show the third embodiment of the present invention. The main difference from the first embodiment of the present invention is using connecting optical cables 11A, 11A, 11A, 11A, 11A with connectors 24, 24, 24, 24, 24 attached to the end and using branching tools 13B, 13B, 13B, 13B, 13B having connecting tool 18A used for connecting the connectors 24, 24, 24, 24, 24 of connecting optical cables 11A, 11A, 11A, 11A, 11A to the connector 15 of FO cable 16. Optical communication trunk cable 1B with the aforementioned configuration has the same effect as that described in the first embodiment of the present invention.

[0015]

Figures 18-22 show the fourth embodiment of the present invention. The main difference from the first embodiment of the present invention is the use of connecting optical cable 28 with MT connector 25 attached to the end of 4-count optical fiber tape 4 drawn a certain distance from the area of optical communication trunk cable main body 5 where the sheath is removed, with MT connector 26 attached to MT connector 25, with simple ferrule 27 attached to the end and using optical communication trunk cable branching tool 13C comprised of cover body 23B that covers the aforementioned area where the sheath is removed, and with simple receptor 29 connected to the simple ferrule 27 of connecting optical cable 28 attached to one end. For optical communication trunk cable 1C with the aforementioned configuration, as shown in Figure 22, simple receptor 29 and optical wiring box 14 can be easily connected by FO cable 16. The end of FO cable 16 connected to simple receptor 29 of optical communication trunk cable branching tool 13C on the side of said simple receptor 29 is covered by a soft vinyl cover 3 that covers the end of optical communication trunk cable branching tool 13C.

[0016]

Tape slot type optical communication trunk cable main body 5 is used in each of the aforementioned embodiments of the present invention. The present invention is not limited in this way. It is also possible to use a bundle of optical fibers covered by a sheath. The number of 4-count optical fibers can be 10, 15, 25, or 50. Branching tools 13, 13A, 13B, 13C can be set only on certain floors instead of on each floor.

[0017]

Effects of the present invention

As explained above, the present invention has the following effects.

[0018]

(1) The optical communication trunk cable of the present invention is comprised of an optical communication trunk cable main body wherein a plurality of coated optical fibers or optical fiber tapes used in a state suspended from the top to the bottom of a structure are covered by a sheath, a connecting optical cable wherein the sheath in at least two prescribed positions on an optical communication trunk cable main body is removed at the factory and wherein a connector is attached to the end welded and connected to preset coated optical fibers or optical fiber tapes in the optical communication trunk cable main body, a cover that covers the bottoms of the areas where the sheath is removed such that the end of the aforementioned connecting optical cable projects outwards, and a branching tool comprised of a base plate on which a connecting tool used for connecting the connector of the connecting optical cable and the connector of an FO cable connected to an optical wiring box at the job site is mounted, a case body that covers the base plate and the optical communication trunk cable main body at the position of the base plate, and a cover body wherein the base plate that is installed in a detachable manner on the case body is accommodated. Therefore, there is no need to weld and connect the optical communication trunk cable main body and the connecting optical cable at the job site.

[0019]

(2) According to point (1), since the branching parts for connecting the coated optical fibers or optical fiber tapes of the optical communication trunk cable main body to the connecting optical cables are welded and connected at the factory, the quality can be guaranteed. Consequently, the reliability of the wiring of the optical communication trunk cable can be improved.

[0020]

(3) According to point (1), since it is only necessary to connect the connector and the connecting tool and to install the branching tool comprised of base plate, case body, and cover body, the connecting operation can be carried out easily even without a technician with special knowledge of connecting optical cables.

[0021]

(4) Claims 2, 3, 4, also have said effects (1)-(3).

#### Brief description of the figures

Figure 1 is a diagram explaining the use state of the first embodiment of the present invention.

Figure 2 is a diagram explaining the first embodiment of the present invention.

Figure 3 is a diagram explaining the optical communication trunk cable main body in the first embodiment of the present invention.

Figure 4 is a diagram explaining the suspending tool in the first embodiment of the present invention.

Figure 5 is a diagram explaining the connecting state of the branching part in the first embodiment of the present invention.

Figure 6 is a diagram explaining the installation state of the branching tool in the first embodiment of the present invention.

Figure 7 is the exploded diagram of the first embodiment of the present invention.

Figure 8 is the cross-sectional view along line 8-8 in Figure 6.

Figure 9 is the cross-sectional view along line 9-9 in Figure 6.

Figure 10 is a diagram explaining the use state of the second embodiment of the present invention.

Figure 11 is a diagram explaining the second embodiment of the present invention.

Figure 12 is a diagram explaining the branching part in the second embodiment of the present invention.

Figure 13 is the exploded diagram of the branching tool in the second embodiment of the present invention.

Figure 14 is a diagram explaining the use state of the third embodiment of the present invention.

Figure 15 is a diagram explaining the third embodiment of the present invention.

Figure 16 is a diagram explaining the installation state of the branching tool in the third embodiment of the present invention.

Figure 17 is the exploded diagram of the branching tool in the third embodiment of the present invention.

Figure 18 is a diagram explaining the use state of the fourth embodiment of the present invention.

Figure 19 is a diagram explaining the fourth embodiment of the present invention.

Figure 20 is a diagram explaining the connection state of the branching part in the fourth embodiment of the present invention.

Figure 21 is a diagram explaining the installation state of the branching tool in the fourth embodiment of the present invention.

Figure 22 is the oblique view of the fourth embodiment of the present invention.

#### Explanation of symbols

1, 1A, 1B, 1C	Optical communication trunk cable
2	Structure
3	Through-hole
4	4-count optical fiber tape
5	Optical communication trunk cable main body
6	Installation fixture
7	Cable suspending tool
8	Sheath
9	Protective tube
10	MU-type simple ferrule
11, 11A	Connecting optical cable
12	Cover
13, 13A, 13B, 13C	Branching tool
14	Optical wiring box
15	Mu-type connector
16	FO cable
17	Accommodating part
18, 18A	Connecting tool
19	Base plate
20	Base plate supporting part
21, 21A, 21B	Case body
22	Screw
23, 23A 23B	Cover body
24	Connector

- 25 MT connector
- 26 MT connector
- 27 Simple ferrule
- 28 Connecting optical cable
- 29 Simple receptor
- 30 Soft vinyl cover

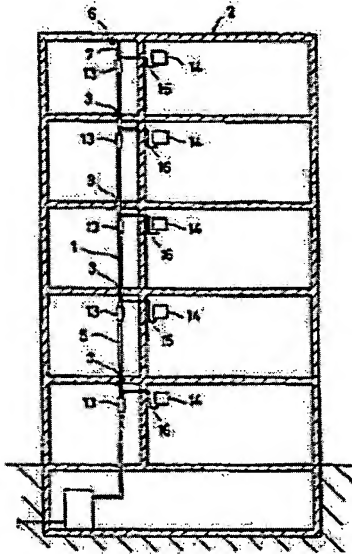


Figure 1

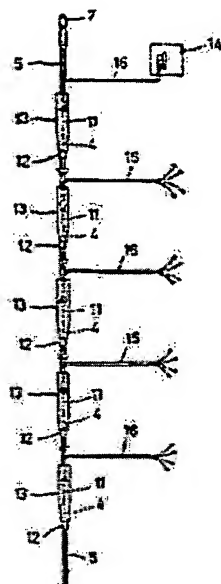


Figure 2

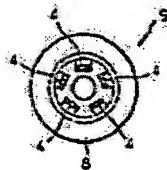


Figure 3

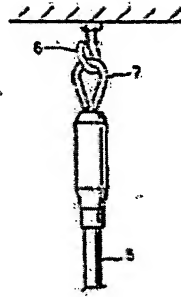


Figure 4

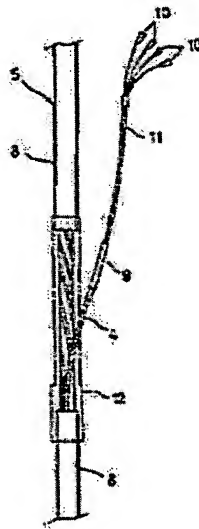


Figure 5



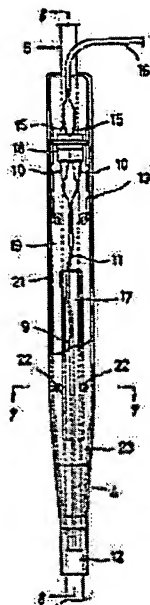


Figure 6

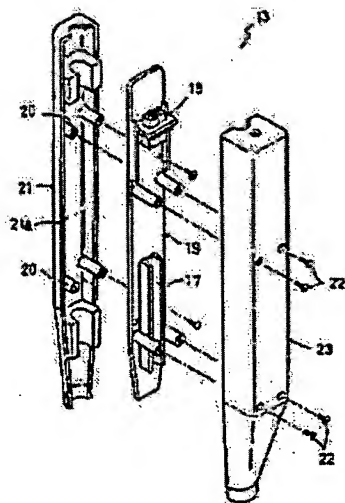


Figure 7

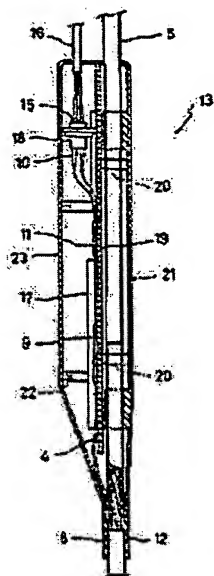


Figure 8

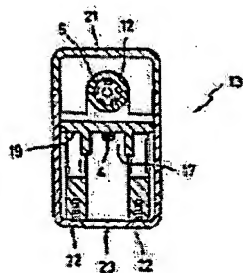


Figure 9



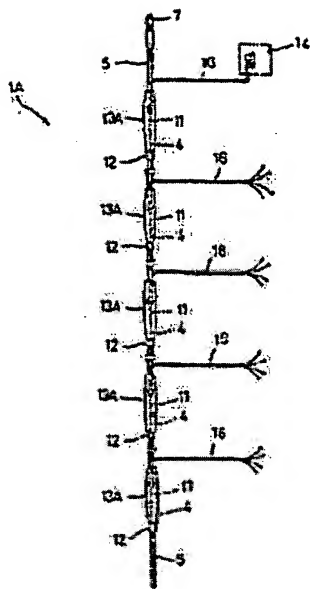


Figure 11

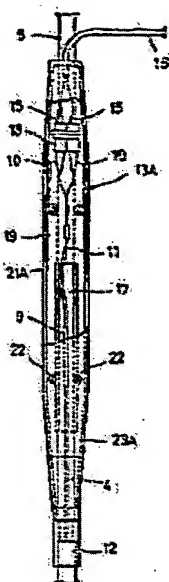


Figure 12

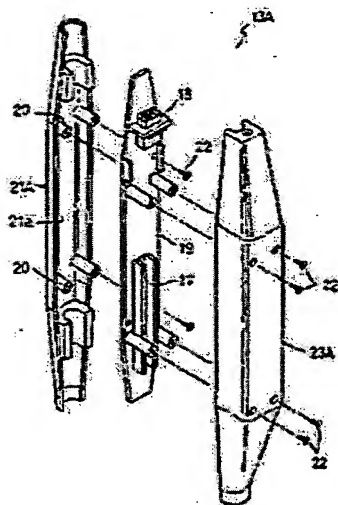


Figure 13

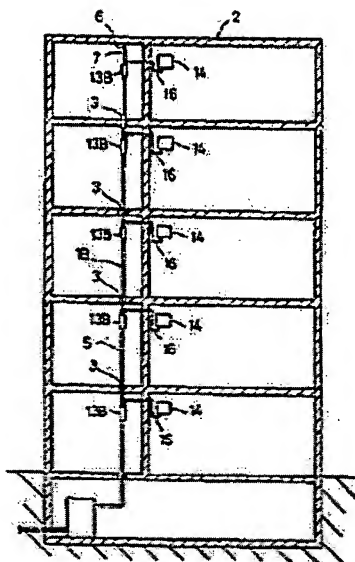


Figure 14

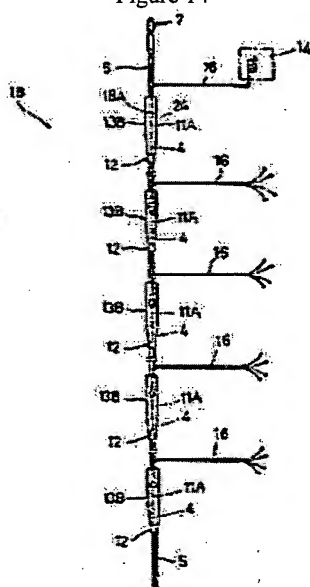


Figure 15

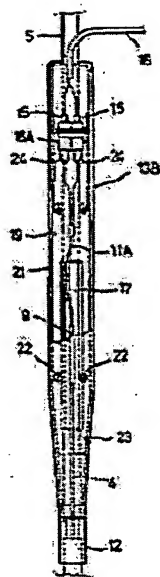


Figure 16

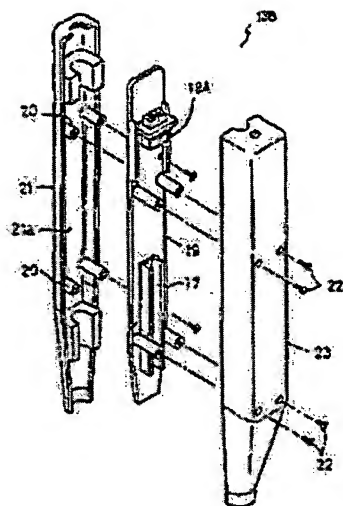


Figure 17

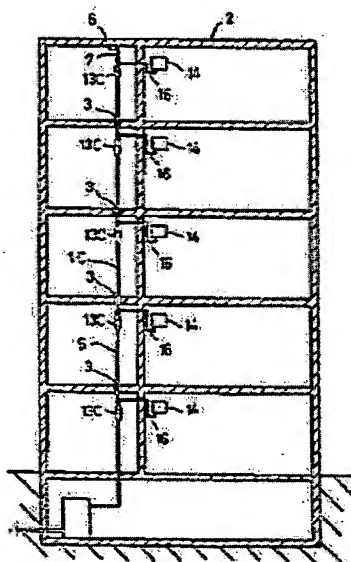


Figure 18



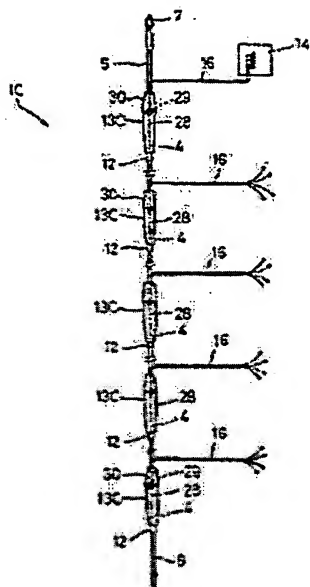


Figure 19

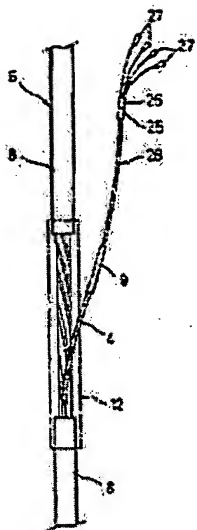


Figure 20

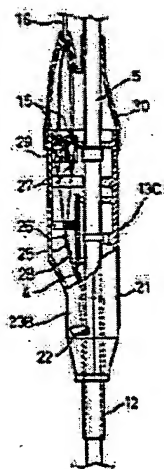


Figure 21

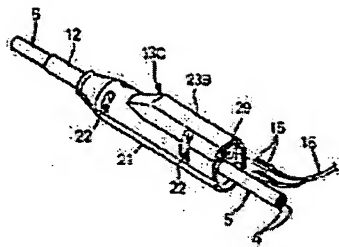


Figure 22

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**